UNITED
NATIONS

S

Security Council

Distr.
GENERAL

S/1994/31
14 January 1994

ORIGINAL: ENGLISH

NOTE BY THE SECRETARY-GENERAL

The Secretary-General has the honour to transmit to the members of the Security Council the attached communication of 11 January 1994, which he has received from the Director General of the International Atomic Energy Agency (IAEA).

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Annex

Letter dated 11 January 1994 from the Director General of the International Atomic Energy Agency addressed to the Secretary-General

Please find attached the report of the twenty-second IAEA inspection in Iraq under Security Council resolution 687 (1991). You may deem it appropriate to transmit the report to the members of the Security Council. I remain, of course, available with the Chief Inspectors, Messrs. Richard Hooper and Garry Dillon, for any consultations you or the Council may wish to have.

(Signed) Hans BLIX

Appendix

Report on the twenty-second IAEA on-site inspection in Iraq under Security Council resolution 687 (1991) 1-15 November 1993

SALIENT POINTS

- The twenty second IAEA inspection in Iraq was devoted to (i) the fall collection of surface water samples, (ii) further verification of the Iraqi January and August 1993 Annex 3 equipment declarations and equipment related information obtained outside Iraq, (iii) follow-up on information, particularly on the subject of centrifuge related technical advice that came from outside Iraq, provided during the 2-8 October 1993 high level talks in Baghdad, (iv) follow-up activities related to the nuclear material and (v) various monitoring activities. A total of 41 sites or establishments were visited in the course of this inspection.

- Part of the ongoing monitoring and verification (OMV) effort in Iraq involves the periodic radiometric survey of the main water bodies in Iraq. This requires the collection of surface water, sediment and biota samples. Fifteen locations along the Tigris-Euphrates watersheds were sampled.

- Further progress was made during the course of the mission in clarifying, with the Iraqi side, the reporting requirements of Annex 3 of the IAEA's OMV plan and the reconciliation of Iraqi equipment declarations with information obtained outside of Iraq. Seventeen establishments were visited in connection with this work. A revised Annex 3 declaration that incorporated the identified improvements was handed over to the team at the conclusion of the mission.

- Two meetings were held with the Iraqi side on the subject of the technical advice they had obtained from sources outside Iraq that had aided their centrifuge development efforts. The details provided regarding the evolution of the Iraqi centrifuge programme, the areas where they experienced difficulties, their strategy for dealing with these

difficulties by seeking help from outside Iraq and, at the same time, taking advantage of additional information that was offered or otherwise obtained are credible. The very specific technical details provided regarding individual components of the Iraqi prototype magnetic centrifuges and the process through which they evolved are consistent with available information.

- Detailed microscopic examination, bulk density assessments and sampling for chemical analysis were performed on UO_2 contained in 201 drums declared by the Iraqi side to have come from Brazil. These results were, in turn, compared to UO_2 of Iraqi origin. This work together with a detailed review of literature describing Brazilian ore bodies and UO_2 production processes indicates that, pending results from the chemical analysis of samples, the material in question is not indigenous to Iraq (nor was it the result of an Iraqi UO_2 production process) and that the most likely source of the material is Brazil as declared. Further corroboration will be sought with the assistance of the Brazilian Government.

- Monitoring inspections were carried out at the eight so-called "core" sites of the former Iraqi nuclear programme. Existing building modifications, new construction and future plans for turning four of the sites (Tarmiya, Al Sharqat, Al Jezira and Al Furat) to other, non-nuclear applications were reviewed. A more detailed declaration relevant to Annex 2 of the IAEA's OMV plan was provided in the course of the mission.

- An action identified during a previous mission - the filling and sealing of the carbonate mine at Abu Skhair - was completed during IAEA-22. Overall, the inspection ran smoothly and the Iraqi side was helpful throughout.

INTRODUCTION

1. This report summarizes the results of the twenty-second mission carried out in Iraq by the IAEA under the United Nations Security Council resolution 687 (1991), with the assistance and co-operation of the Special Commission of the United Nations. The mission took place from 1 to 15 November and was headed by Mr. Richard Hooper of the IAEA for the period 1 to 7 November and Mr. Garry Dillon of the IAEA for the period 8 to 15 November. The complete team consisted of 17 inspectors (comprising 9 nationalities) and support staff. Several team members were not in Iraq for the entire inspection period depending on their availability and the work to be done.

2. The objectives of the mission were:

- the collection of surface water, sediment and biota samples at selected locations along the Tigris-Euphrates watersheds. This work is a continuing part of the monitoring effort in iraq;

- the further verification of the Iraqi Annex 3 equipment declarations of January and August 1993 and follow-up on equipment related information obtained outside Iraq;

- the follow-up on information, particularly on the subject of centrifuge related technical advice that came from outside Iraq, provided by the Iraqi side during the 2 - 8 October 1993 high level technical talks in Baghdad;

- the follow-up on questions regarding the nuclear material declared to have originated from Brazil and the nuclear material associated with the "30 July project";

- the conduct of monitoring inspections at sites previously visited.

3. Inspection activities were carried out at 41 sites or establishments. These are listed in Table 1.

ACTIVITIES RELATED TO THE RADIOMETRIC HYDROLOGIC SURVEY

4. A baseline radiometric survey of the surface waters of Iraq was carried out during the fall of 1992. Water, sediment and biota samples were collected at 52 locations along the Tigris and Euphrates rivers, their major tributaries and selected lake basins. The objectives of that survey were to provide added assurance that no undeclared nuclear activities (specifically undeclared reactor and/or reprocessing activities) existed in Iraq and to establish a baseline for a continuing sample collection effort under the OMV programme.

5. The IAEA's current monitoring programme for Iraq includes twice - a - year (spring and fall) radiometric surveys of surface waters. The first of these periodic sample collections was carried out during IAEA-19. The results obtained are consistent with the baseline. The second water sample collection for 1993 was conducted in the course of IAEA-22. A total of fifteen sites were sampled. The sample collection sites are given in Table 2 and indicated on the map labeled as Figure 1. Sample collection procedures were described in the IAEA-15 inspection report.

ACTIVITIES RELATED TO EQUIPMENT

6. During IAEA-22 the Iraqi side established a dual use equipment committee of Directors General from three state establishments to work with the inspection team to resolve (i) any remaining differences in the interpretation of Annex 3 reporting requirements and (ii) any differences between Iraqi declarations and procurement data obtained from outside Iraq. Overall this was a successful process:

Table 1

List of Sites/Establishments Inspected

1.	Tuwaitha, including locations B and C
2.	Al Nafad
3.	Al Shakyli storage
4.	Tarmiya
5.	Al Sharqat
6.	Al Jezira
7.	Al Qaim
8,	Al Furat
9.	Al Firnas (formerly Al Atheer)
10.	Rashdiya Design Centre
11.	Nassr State Establishment
12.	Al Nidda (formerly Al Rabiya)
13.	Badr State Establishment
14.	Um Al Maarick (formerly Auqba bin Nafi)
15.	Daura State Establishment for Heavy Engineering Equipment
16.	Al Amin
17.	Al Meelah
18.	Saddam State Establishment
19.	Al Radwan
20.	Al Amir
21.	Nahrawan
22.	Industrial Engine Factory*
23.	State Establishment for Electrical Industry*
24.	Al Kadesiya
25.	Center for Construction Research*
26.	Abu Skhair Carbonate Mine
27 - 41.	Fifteen sites (see table 2 and figure 1) where water, sediment and biota samples were taken

* visited for first time by IAEA.

- A common understanding of the Annex 3 reporting requirements evolved through a series of meetings with the Iraqi dual use equipment committee. Strong disagreement was expressed with respect to some reporting requirements, particularly for the coordinate measuring machines, but the revised Annex 3 declaration handed over at the end of the inspection contained the required items;

- The Iraqi side prepared a description of machine tools received from the Matrix Churchill company. The description, indicating machine type, utilization and current location (distributed across 18 establishments), is consistent with the Matrix Churchill shipping records. More that 85% of the machines have been seen by inspection teams. The remaining 15% are located and will be inspected during the next mission;

- There is generally good agreement between available manufacturer's shipping data and Iraqi equipment declarations. Several manufacturers have yet to respond to requests for information.

7. Equipment related inspections were carried out in seventeen establishments. Three of the sites, as indicated in Table 1, were visited for the first time by an IAEA inspection team. Several of the inspections were carried out without advance notice. Activities included the inspection of equipment identified in revised Iraqi declarations, the further evaluation of specific pieces of equipment vis a vis Annex 3 reporting requirements, and the monitoring of equipment utilization and seals check.

Table 2

Sample Collection Sites for the Fall 1993 Radiometric Survey of Iraq's Surface Waters

Name of the location	Region No.	Corresponding number on the map
Al Fathah	1	17
Tikrit	1	1c
Little Zab	2	2a
Al Mawsid	3	3
North of Kuwayr	3	3b
Saddam Dam	4	4a
Lake Habbaniyah	5	5b
North Baghdad	6	6a
Nahr al Uzaym	7	7a
Hit	8	47
Diyala River	9	9a
South of Sarabadi	10	10b
Shatt al Zharref	10	10c
Al Kufah	10	10h
Third River	10	10i

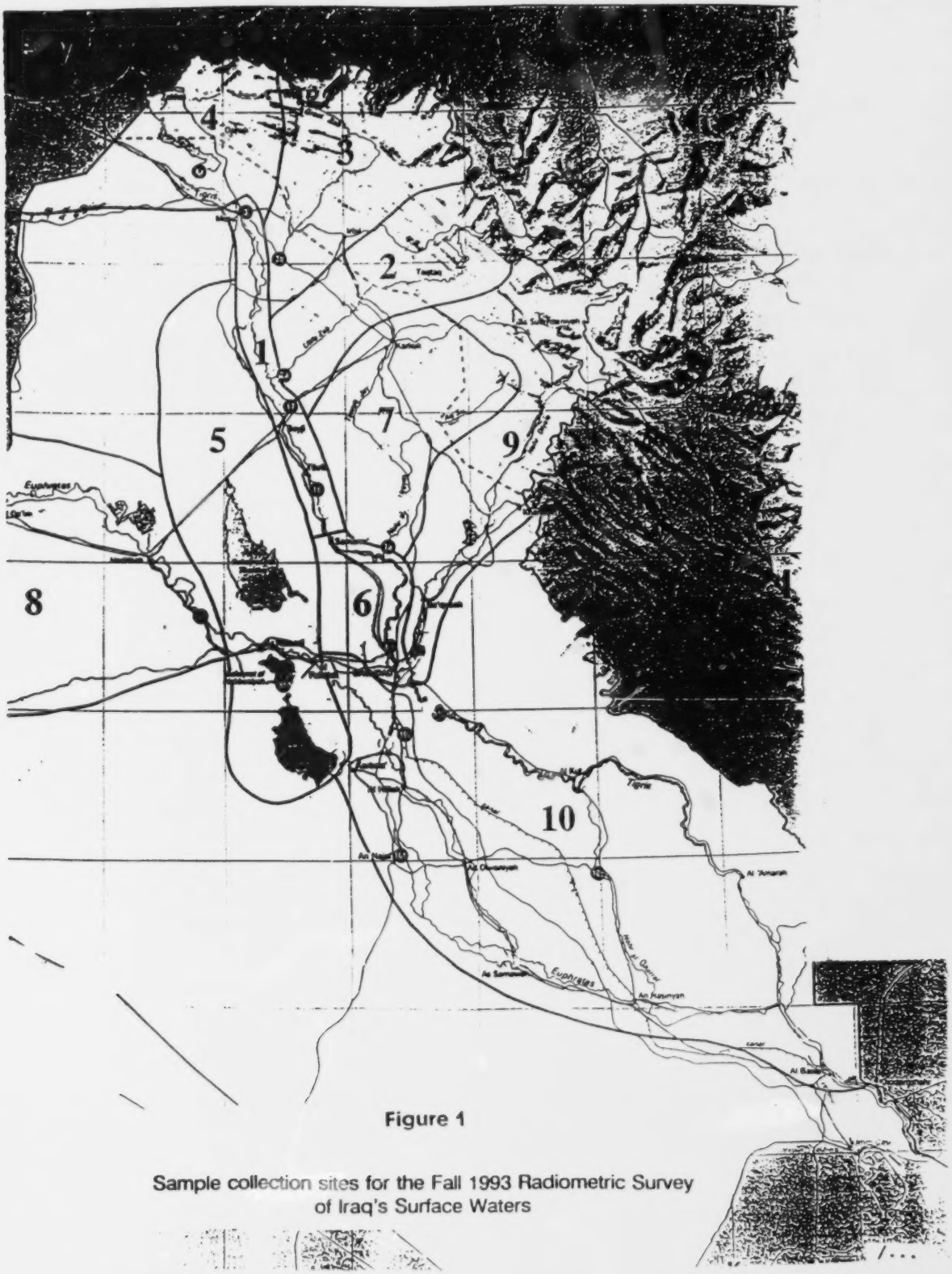


Figure 1

Sample collection sites for the Fall 1993 Radiometric Survey of Iraq's Surface Waters

ACTIVITIES RELATED TO NUCLEAR MATERIAL

8. The IAEA-18 inspection report contains a detailed description of verification results that called into question the origin(s) of 20.6 tonnes of natural uranium in the form of UO_2 declared by the Iraqi side to have come from Brazil and the declared source(s) of material processed in the "30 July Project" carried out in the building 73 complex at Tuwaitha.

9. A detailed microscopic examination, bulk density assessments and sampling for chemical analysis were performed on UO_2 contained in 201 drums declared by the Iraqi side to have come from Brazil. These results were, in turn, compared to UO_2 of Iraqi origin. This work together with a detailed review of literature describing Brazilian ore bodies and UO_2 production processes (both chemical and mechanical aspects) indicates that, pending results from the chemical analysis of samples, the material in question is not indigenous to Iraq (nor was it the result of an Iraqi UO_2 production process) and that the most likely source of the material is Brazil as declared.

10. The Iraqi side provided a list of analytical values for part of the material. They also indicated that the original order was for 100 tonnes of UO_2 to be delivered in five shipments but that the arrangement was informal with no contract or other formal documentation. They further describe that after receiving two shipments (27 tonnes) without any certification regarding the contents they became unhappy with the quality of the material and terminated the arrangement. Further corroboration will be sought with the assistance of the Brazilian Government.

    The UO_2 contained in the 201 drums is a mixture of coarse powder, fine powder, compacted powder and small spheres. Given that levels of impurities are within acceptable limits, requirements for physical qualities depend upon the end use. The end use intended by the Iraqi side was conversion to UCl_4 or UF_4.

The material declared to have come from Brazil is of poor quality for this use because of its extremely low reactive surface. Iraqi chemists indicate that the portion of the material that was used to produce UCl_4 in building 85 at Tuwaitha was subjected to successive siftings before it was introduced to the production process.

11. No progress was made in resolving the contradiction between the source(s) of material contained in filters declared to have been removed from building 73a and the source(s) of material that Iraq has declared was utilized in the "30 July Project" (see inspection report for IAEA-18). At the first high level talks in New York (31 August - 9 September 1993) the Iraqi side reported that they had interviewed a number of former IAEC employees who had worked in the relevant areas in Tuwaitha. The results of these interviews had indicated that filters from several Tuwaitha facilities (including those from the UCl_4 production area in building 85, where both Brazilian and Al Jezira (Al Qaim) material was used, had been collected together and sent to building 73a for recovery and disposal. This explanation was repeated to the IAEA-22 inspection team and the Iraqi side stated that they had nothing further to add. There is, of course, no way to verify where individual filters had been installed.

12. However, regardless of where the filters were installed, samples from waste solutions declared to have derived from operations carried out in buildings 73a and 73b and samples from a kiln declared to have been installed in building 73a contain uranium consistent with Al Qaim material (i.e., the same material as found in the filters). The obvious explanation consistent with the sample data and inspector observations is that all of the activities declared to have been carried out in the building 73 complex, i.e.,

- the "30 July Project" fuel fabrication experiments utilizing mostly safeguarded material (of Italian origin) in a safeguarded facility (buildings 73a and 73b)

and

- the uranium metal production work utilizing unsafeguarded material (primarily of Al Qaim origin) in an unsafeguarded facility (building 73c)

were, in fact, carried out in buildings 73a and 73b only.

ACTIVITIES RELATED TO URANIUM ENRICHMENT

13. Prior to the recent round of high level technical talks that began in late August the most important open questions regarding the Iraqi uranium enrichment efforts concerned the sources of the maraging steel and outside technical advice for their centrifuge programme. Both of these questions were highlighted in the report from the 31 August - 8 September 1993 meetings in New York (see UN document S/26451 dated 16 September 1993). During the second series of high level technical talks held in Baghdad (2-8 October 1993) the Iraqi side provided credible information on both issues.

14. The Iraqi side identified an individual as their agent for the procurement of the maraging steel. They indicated that they received the 100 tonnes of steel in two consignments. They described the physical configuration of the material and the transportation route from a northern European port to Iraq. The Iraqi side reiterated that they did not know who manufactured the steel but offered some speculation regarding the nationality of the manufacturer based on circumstantial evidence. Follow-up action has been requested of the appropriate Member State Governments.

15. The information provided by the Iraqi side, during the Baghdad high level technical meetings (2 - 8 October 1993), regarding the sources and circumstances through which they obtained technical advice from outside Iraq that aided their centrifuge development work was credible but lacked detail. The necessary details to complete the picture were provided to the twenty-second inspection team. The names of the individuals, the circumstances under which they got involved and the details of the technical help they, wittingly or unwittingly, provided are not being disclosed pending decisions by Member State Governments regarding past or current legal actions. However, in general terms, technical help was provided in the following areas:

- vacuum and clean room technologies, heat treatment of maraging steel and advice regarding machine tools;

- simulation software for design and evaluation applications;

- advice regarding the procurement of specific components and equipment;

- two general assembly drawings and 10-12 drawings of specific components;

- technical specifications for some specific components.

The Iraqi side reviewed their work on the Beams type oil centrifuge and emphasized the importance of this experience in targeting the technical areas where they had difficulties when they moved on to the Zippe type magnetic centrifuge. This allowed them to focus and carefully manage their search for help outside Iraq. The acquisition of the general assembly and component drawings was fortuitous and served to greatly accelerate their programme. Iraq's centrifuge development at the time of the Gulf War involved two basic designs (maraging steel and carbon

fiber rotor) and a number of variation in the detailed design of components that evolved directly from the general assembly and component drawings obtained outside Iraq. The Iraqi plan, which was well on its way, was to procure the components necessary for about 50 prototype machines from outside Iraq while they were developing their own manufacturing capability. Some components were procured directly and others were being obtained indirectly under the cover of demonstration tests as they negotiated for the purchase of machine tools.

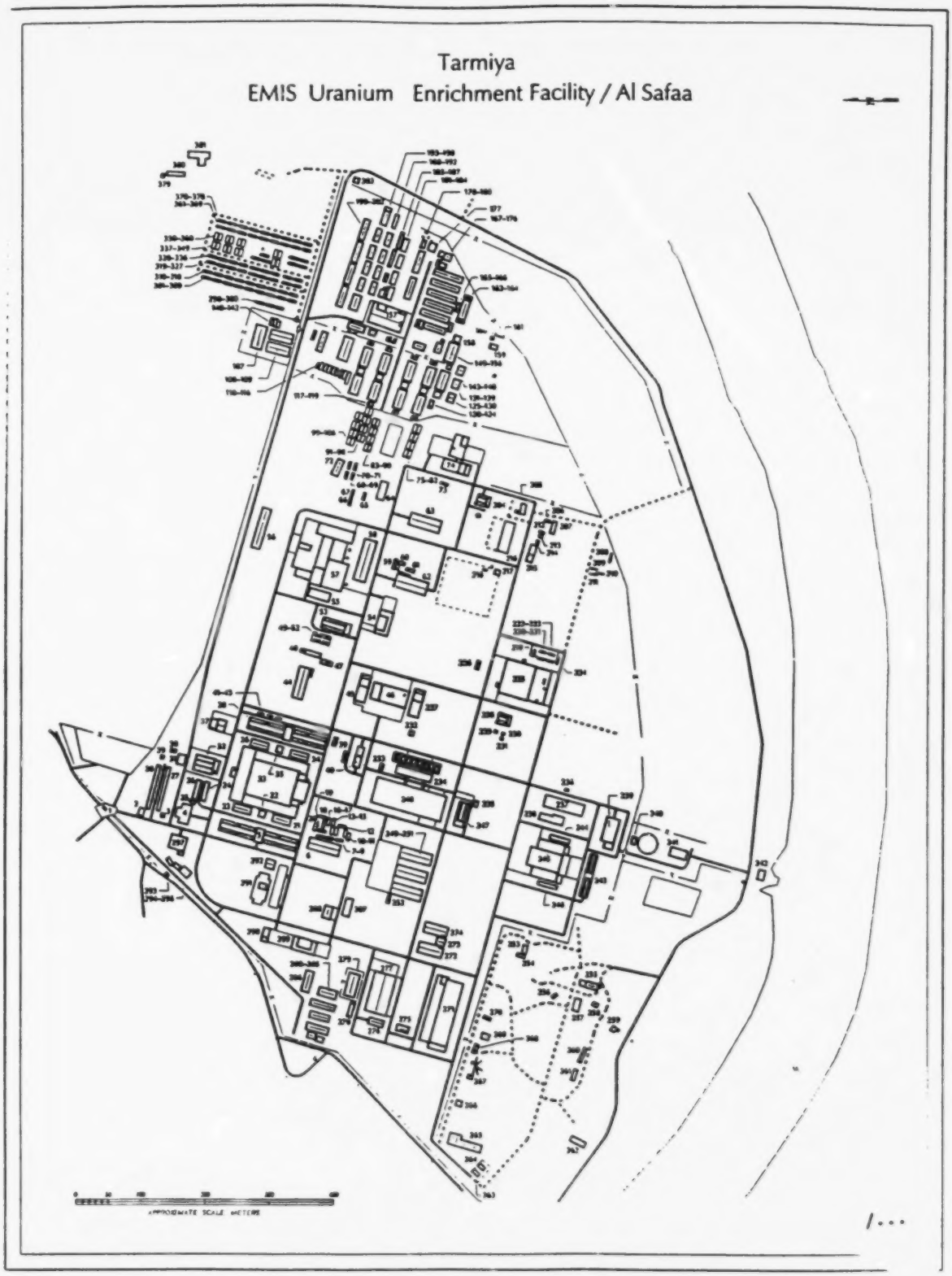
MONITORING ACTIVITIES AT CORE SITES

16. Inspections to monitor activities at the Al Sharqat, Tarmiya, Rashdiya, Tuwaitha, Al Furat, Al Firnas [Al Atheer], Al Jezira and Al Qaim sites were carried out during the twenty-second mission. Iraqi activities to convert four of these sites (Al Sharqat, Tarmiya, Al Furat and Al Jezira) to non-nuclear use are proceeding and the status of the development at the sites was evaluated and compared against the respective declarations made in accordance with Annex 2 of the OMV, where these were available. Nothing was observed that was indicative of prohibited activities.

Al Sharqat The entire site was inspected. The construction of the nitric/sulfuric acid production plants east of the EMIS chemical recovery area was progressing quickly with the shells of several buildings more than 50% complete. None of the buildings are ready for internal finishing and no plant components are installed, or in evidence on the site. The building descriptions given appeared to be in agreement with the "declaration" received in accordance with Annex 2 of the OMV. The current labor force was stated to be about 40 Al Qa Qaa personnel and about 300 construction workers. The facility will eventually be the principal supplier of nitric and sulfuric acid to the Iraqi industry.

The former EMIS site at Al Sharqat was inspected. The site remains unchanged from previous inspections. There was no indications that any attempts were being made to convert the buildings to other

FIGURE 2



(non-nuclear) usage and it was stated that the badly damaged buildings would simply be abandoned.

Tarmiya The Tarmiya site (fig. 2) is being adapted to the requirements of the Research Centre for Industrial Chemistry which was established in March 1992. Visits were made to the facilities which had been converted to commercial non-nuclear applications and to those facilities which had been of significance in the former EMIS programme. The activities planned or in progress in the converted facilities were generally consistent with the declaration previously provided. Of note was the usage of mixer-settlers. In building 45/46 there were twin banks of 16 small (≈300 ml) units, which had been brought from Tuwaitha and were being used for the separation of lanthanides. A set of 32 larger (≈1litre) units were being used on a project concerned with vanadium extraction and 15 mixer-settlers units of 5 litre capacity were being used for the purification of phosphoric acid.

In addition to the facilities previously declared, the team was advised that building 64 was now allocated to "Medical and Safety", building 291 to "Administration" and building 271 to "Engineering Services". With the exception of buildings 107 & 109 (Engineering Services), all the buildings declared to have been converted to commercial, non-nuclear usage were visited and their utilization was checked to be consistent with the declaration.

Buildings 249/251 (stores 1,2 & 3) appeared to be unremarkable [although a co-located chemical store contained ≈30 large, greater than 5 litre ingots of metallic antimony.].

The buildings on the site remain unchanged from previous inspections. Two halls of building 230 are being used for the storage of spent catalyst from Al Qaim, awaiting recovery of molybdenum and a stock of flue slag from oil burning power stations from which it is intended to recover vanadium.

Rashdiya A short notice inspection of the Engineering Design Centre at Rashdiya was carried out. The main functions of the Institute were described to be:

- Production of carbon black for the paint and rubber industry
- Design work e.g., for steel plate rolling mills for Nassr
- Lab scale production of copper benzoate
- Coating and plating
- Analytical chemistry
- Mechanical/physical properties testing

It was stated that the staff of Rashdiya numbered just less than 300 of which approximately 100 were on-site at the Beji site operating a carbon black pilot plant and 65 were working at Al Nahrawan. The facility itself was unremarkable except for the characteristic lack of activity.

The security fence between the west and east sections of the site had been enlarged by the addition of four rows of concrete blocks and two strands of barbed wire. As planned, a request was made to visit the east building which resulted in some confusion on the Iraqi side regarding the IAEA's rights of access vis a vis the original designation. The east building has now been separated from the Rashdiya Institute and is currently identified as a factory for the production of agricultural machinery. This particular building has been repeatedly inspected by the IAEA. The situation was clarified with the senior Iraqi counterpart and after only a minor delay access was granted.

The building was subjected to a detailed re-examination and sketches and photographic records were made. There were no indications of activity or preparation for usage of the building.

Tuwaitha All of the principal facilities at the Tuwaitha site were inspected including Location C, Al Nafad and the spent fuel storage site (Location B). Seals were checked and some replaced on a random basis at all relevant locations. Additional tree samples were taken for tritium analysis.

Al Furat Civil engineering work is about 70% complete with internal finishing in progress in a number of the new buildings. The intended use of each building was described to the team and recorded on the site layout plan which was provided by the Iraqi counterparts. It was stated that MIC intends to use the site for general mechanical and chemical engineering R&D activities needed to support the armed forces. All of the original buildings of the site are being refurbished. For example, B00 is being converted to offices and mechanical engineering workshops, B03 is to be an incoming materials store and B04 is to be a computer building having an IBM and Vax machine supported by HP personal computers. Buildings B01 and B02 remain untouched.

It was explained that about 500 people would be employed at the site once it is complete. The scientific and engineering staff would be transferred from other facilities.

Al Firnas (Al Atheer) Inspection of the facilities indicated that the Annex 2 declaration of the purpose of the 're-dedicated' site seemed to be somewhat overstated and there was some difficulty in correlating the declared activities with the range of practical work that was actually in progress. For example, the so-called pilot plant for tungsten carbide recovery was small scale, very basic and directed toward the pulverization and acid cleaning (cobalt removal) of old cutting tool bits. The pilot plant for the production of aircraft components (heat sinks) was found to be no more than a small disk-brake refurbishment workshop. The Iraqi counterparts were helpful,

if not fully acquainted with the scope of the declaration, and facilitated visits to all locations requested.

Al Qaim Most of the principal buildings on the site were visited, in particular, the former uranium purification plant. From an operational point this plant is utterly destroyed and the Iraqi side wants to salvage equipment from this plant to be utilized in other plants on the Al Qaim site. It was also stated that the Iraqi side intends to carry out a comprehensive clean-up of the plant to minimize environmental contamination, in particular leaching to ground-water. The principal plant items targeted for salvage are high quality stainless steel tanks, pipes and flanges. Some control equipment is also planned to be recovered. The Iraqi side was advised that they would receive a written response to their request asking for an inventory of plant items that are proposed to be salvaged. Samples were taken of the dilute phosphoric acid and the ammonium nitrate raw product.

Al Jezira The former nuclear related facilities and the new pilot plant for the Fe_2O_3 project were inspected. The Fe_2O_3 plant was found to be essentially as described in the Annex 2 declaration. The process building was still a skeleton structure but the buildings housing ancillaries services were well advanced. In connection with the low concentration uranium bearing wastes remaining in two of the three large settling tanks it was observed that the contents of the second settling tank had evaporated to dryness and the sludge recovered. The resulting 59 drums (200 l) of material will be transferred to Location C before the next inspection. Drums of solid low-level waste had been removed from the store adjacent to the tanks and have been stored in tank 1. A token amount of concrete has been poured on top of these drums but not enough to serve any meaningful protection against corrosion or dusting. It was agreed that after the next consignment of drums has been transferred to tank 1 a more substantial amount of concrete will be poured.

The rubble from the north end of the UCl_4 plant has been removed to the UO_2 production plant compound. Some remaining sections of the UCl_4 process building are being refurbished. The UO_2 feed hall has now been isolated and converted into a store (as yet unused) and the office area at the other end of the plant is being totally refurbished and up-dated. The main process hall is "untouched" and the Iraqi side stated that there are no plans to utilize this part of the building. Refurbishment of the services building next to the UCl_4 plant is under consideration. It is still planned to close off the UO_2 plant compound and use it for active waste storage although no action has yet been taken to fence off and gate the access point. These actions to recover and utilize moderately damaged portions of the UCl_4 production buildings are contrary to an agreement with the Iraqi side made and documented during the fifteenth mission. Clarification will be sought during the next inspection. Some 30-40 used filter packs, stored near the entrance to the main UCl_4 process hall are to be transferred to Tuwaitha along with the drums of sludge from tank 2.

The IAEA seals on all four tagged equipment items were checked and one seal was changed.